Weather Notes

WORLD RECORD LOW TEMPERATURE

South Pole, September 17, 1957*

A new world record low temperature of −102.1° F. was set at the Amundsen-Scott IGY Station (South Pole) at 2137 GMT on September 17, 1957. This was lower by 1.7° F. than the previous world record of −100.4° F. set at the same station on May 11, 1957 (see *Monthly Weather Review*, vol. 85, No. 6, June 1957, p. 207).

The new record came as the climax to the coldest sustained period in the coldest month so far experienced at this frigid outpost. From the time of the previous record-breaking mark on May 11 the daily minimum temperature went below −95° F. on 17 occasions, while during the period in which the new record was set the temperature remained below −90° for 93 hours!

It is interesting to note that this period of extreme cold came at the very close of the South Pole winter season. In fact, throughout this period the sun's image (although greatly distorted) was observed as a flaming mirage of the upper limb. Due to refraction phenomena in the highly stratified air, the sun reappeared "prematurely" about a week before the "official" sunrise on September 23, 1957, when the actual disk was about 3 degrees below the horizon.

Table 1 presents the significant surface and near-surface meteorological data about the time at which the new record was established The 2-m. air temperatures are those observed in the screen and constitute the official air temperatures for the station.

A deck of cirrostratus began advancing at 2200 GMT on September 17 and the sky became overcast by 0800 GMT on the 18th, at which time light snow began to fall. Thus the rapid warming observed between 0245 and 1200 GMT September 18 was undoubtedly the result of increased long-wave radiation to the surface from the cloud cover.

Reference to the note and comparable figures in the *Monthly Weather Review* reporting the May 11 observations brings out noteworthy differences and similarities. On September 17 the wind directions veered significantly from those observed on May 11, giving further substantiation to the hypothesis that the occurrence of extreme low temperatures is probably related to the diminution of vertical mixing rather than advection or cold-air drainage from elsewhere.

However, surface wind directions in the sector 60° E. through 160° E. were accompanied by significantly lower temperatures than surface winds from any other direction. It should be pointed out that greater than 90 percent of the surface winds were from a direction 20° W. clockwise to 180° (through 90° E.). Further, the wind speeds immediately preceding the −102.1° reading were lower than those preceding the −100.4° reading on May 11, and the surface inversion nearly 3 times as great. At the time of the −102.1° reading the inversion from 2 to 10 m. was 22.6 F.°, while for the −100.4° reading on May 11 that inversion was only 8.4 F.° On September 17 there was a rise of over 70 F.° in the lower 30 mb. or so of the atmosphere compared to about 50 F.° rise on May 11.

Table 2 is a continuation of the monthly data presented in the note on p. 207 of the June 1957 *Monthly Weather Review*.

*A previous note in the *Monthly Weather Review* (vol. 85, No. 9, Sept. 1957, p. 326) reported this record low temperature as having been observed at 2137 GMT, Sept. 18, 1957. That note should be corrected to indicate 2137 GMT, Sept. 17, 1957.

TABLE 1.—*Meteorological data, Amundsen-Scott IGY Station (South Pole), September 17–18, 1957*

Date	Time (GMT)	Wind		Temperature (° F.)			
		Direction (Meridian)	Speed (kt.)	Sfc.	Air		
					2m.	5m.	10m.
September 17	1800	70E	5	−99.3	−96.6	−94.7	−77.8
	1930	----------	calm	−100.0	−93.7	−90.8	−75.2
	2003	90E	2	−101.7	−100.0	−97.5	−85.9
	2137	110E	4	−103.3	−102.1	−101.0	−79.5
	2200	90E	5	−99.0	−94.9	−88.0	−75.6
	2340	110E	4	−102.2	−101.7	−101.1	−82.0
September 18	0245	135E	6	−100.5	−100.0	−98.8	−90.6
	1200	70E	7	−69.1	−69.1	−69.1	−68.8

TABLE 2.—*Mean wind data, mean and extreme temperatures. Amundsen-Scott IGY Station (South Pole)*

Month	Mean Wind		Temperature (° F.)		
	Direction (Meridian)	Speed (kt.)	Mean	Max.	Min.
1957					
January*	0°	9	−18.1	−6.0	−29.8
February	20E	10	−36.8	−18.0	−69.2
March	30E	11	−64.7	−35.0	−82.5
April	20E	15	−69.7	−25.6	−89.1
May	30E	15	−68.3	−30.1	−100.4
June	40E	17	−69.6	−42.3	−97.0
July	20E	15	−77.5	−40.7	−98.8
August	20E	16	−72.7	−45.4	−99.7
September	30E	13	−80.1	−57.7	−102.1
October	30E	14	−62.9	−45.4	−86.1
November	20E	10	−34.4	−2.2	−55.1
December	20E	7	−13.4	−2.0	−21.5

*Period Jan. 11–31.

During the whole of the winter night the mean temperature was approximately −73° F., with a maximum of −25.6° on April 6 and the minimum of −102.1°. During 90 percent of the whole time the temperature was below −58° F., with temperatures below −90° F. about 12 percent of the time. The mean wind speed was about 15 kt. with only 25 hours of calm weather observed. The peak gusts were on the order of 47 kt.—*E. C. Flowers and R. A. McCormick, U. S. Weather Bureau, Washington, D. C.* (Mr. Flowers was Chief Meteorologist at Amundsen-Scott IGY Station, January–December 1957.)

POST-FRONTAL OROGRAPHIC MAMMATOCUMULUS,

Sackets Harbor, N. Y., July 5, 1957

On the afternoon of July 5, 1957, a cool post-frontal mass of polar continental air was moving briskly eastward from Lake Ontario toward the Tug Hill Plateau and Adirondack Mountains of northern New York State, producing vivid evidence of strong on-shore winds and of pronounced convective instability in the form of a strange-looking lenticular cloud with a pronounced mammatocumulus formation on the lower surface. At least one thundercloud was also seen in the general area, but the entire area had, otherwise, large areas of very clear blue sky until late in the afternoon. The observer was taking a pleasure ride by automobile, and the spectacular appearance of very large, very widely spaced cumuli

boldly outlined in the very clear atmosphere led him to watch carefully the clouds and weather encountered.

About noon, near Syracuse, N. Y., cumulus and stratocumulus nearly covered the sky, the temperature was 79° F., the dewpoint, 59° F., and the wind was west at about 13 knots and somewhat gusty. About an hour later, at Mexico, N. Y., about 30 miles north of Syracuse near the southeastern corner of Lake Ontario, the sky was almost clear with a very few small cumuli; visibility was excellent, and the sky was a very deep blue, rare in central New York. A few miles farther north, a few minutes later, at Port Ontario close to the southeastern shore, the sky was still beautifully blue and almost cloudless, but far in the northern sky was a towering cumulonimbus with anvil, with its hard, turbulent surface brightly illuminated with a remarkable, distinctive pink glow, unlike the yellowish white of the nearer small clouds. The crackle and crashes of distant lightning were noticed on the auto radio. Farther north along the shore, the west wind, which had been increasing, became strong enough to make steering difficult on this highway. But the sky became perfectly cloudless, except for the very distant thundercloud. A short distance northeast of Sackets Harbor (slightly west of Watertown, near the northeastern corner of the lake), about 70 miles north of Syracuse about 2 p. m. EST, the sun seemed to become weaker, at first by a thin, nearly invisible white web that was first thought to be cirrus, but soon considered to be altostratus because it became a white layer that was obviously lower and thicker. It extended a few miles west, a few miles north, and many miles south, but it did not extend east of the zenith. By now, the distant thundercloud was much nearer, white instead of pink, and displaced eastward.

On Pillar Point, about 12 miles west of Watertown, around 2:30, the cloud layer observed previously farther southeast had become threateningly dark. It extended many miles south, but its western edge was clean and sharp, oriented approximately along the lake shore. To its west the sky was clear over the lake. To its immediate east the sky was clear, and farther east there were many moderate-sized cumuli. The layer did not extend north beyond Pillar Point; northward the overhead sky was clear, and much farther north there were small cumuli. The tallest cumulus clouds were in the northeastern sky, where the thundercloud had been. Fresh puddles were noticed here along the road, as if the thundercloud had passed here earlier.

By now, the dark layer cloud had a remarkable appearance. It seemed almost as low as the cumulus clouds, so all the while it must have been stratocumulus and not altostratus. But it remained quite shallow, with a smooth, flat, white top and smooth, sharp, white edges, as if it were a large, detached sheet of white altostratus, but much lower and somewhat thicker. It had a definite lenticular appearance, similar to the "wave" clouds near Bishop, Calif. It did not seem to progress eastward. But its outstanding peculiarity was its lower surface: hanging down over a large area were numerous black hemispherical mammatocumulus bulges, each bulge immediately adjacent to its neighbors; the dimensions of each bulge were not larger than about one-tenth of the dimensions of medium-sized fair-weather cumulus clouds. No precipitation or lightning were observed in connection with this cloud, but it had a black, stormy appearance.

At about 3:30 p. m. EST, on the isthmus joining Point Peninsula to the mainland, about 20 miles west of Watertown, where the road passes closely to the shore of the main open part of the lake, the waves were large and white, and spray was driven by the wind across the road. The temperature there was 68° F. and the dewpoint 56°. By comparison, the observer's instruments near Syracuse registered a high of 81° that afternoon. The wind at the shore was estimated to be about 42 m. p. h. from the west, sometimes as high as 50 m. p. h. It was difficult to stand still while using a camera, in such a wind. The sun was shining here. The dark elongated lenticular cloud with mammatocumulus was still there, oriented north-south along the shore and extending far southward from a point a short distance to the south. It seemed to be forming on the west edge and dissipating on the east edge. The sky was still cloudless to the west over the lake, and there were hard, sharply-defined cumuli southeast, east, northeast, and north, the largest northeast. It was clear overhead. Very far in the south-southwest very large, boiling cumulus clouds were seen to be increasing in size.

About 5:15, for a stretch of many miles, beginning a few miles northwest of Watertown and continuing many miles south-southwest of Watertown, the elongated lenticular cloud with dark mammatocumulus was still oriented along the shore, west of the route being travelled, with clear sky beyond it to the west over the lake, clear sky overhead, and many medium-sized cumuli along the eastern horizon. No precipitation or lightning was seen yet.

Near Pulaski, near the southeastern corner of the lake and much closer to the lake than Watertown, at around 5:45 p. m., the highway was well within the area covered by the layer cloud, but now the layer cloud looked like an ordinary flat, high stratus layer, very closely resembling low thick altostratus in appearance; it was fibrous, and seemed to be actually in two layers, the lower layer broken. Here there was no lenticular appearance, and there was no mammatocumulus structure. Not far east, there were cumulus clouds instead of the overhead stratus, and there was no clear strip along the east edge of the layer. A few miles southwest there was a conspicuous thunderstorm cell, with cloud-to-ground lightning and a dense shaft of rain. This storm was moving east. Winds were still strong enough to require extra caution in steering the automobile.

Much farther south, in the vicinity of Central Square and Brewerton, about 15 miles north of Syracuse, stratocumulus connecting that thundercloud with another thunderstorm several miles south was passing eastward overhead, with lightning and a sprinkle of large raindrops. The time was now about 6:15 p. m. The north thunderstorm appeared much more intense than the south thunderstorm. Many miles east there was an isolated cumulonimbus with heavy shower. In Syracuse at 7 p. m., the sky was almost covered with bulky stratocumulus masses, and the streets were wet. Shortly afterward the sky had fewer clouds, and the observer's instruments showed 62° F. temperature, 55° dewpoint, west wind at about 5 knots, and 0.02 inch of rain caught in the gage while he was gone. No fronts or squall lines appeared on the published weather maps in connection with these storms.

The weather thus described was evidently influenced by topography. A line running east-west through Syracuse separates the Alleghany Plateau (1,200 to 2,200 feet above mean sea level) to the south, from the Lake Plain (400 feet above m. s. l.) to the north. Lake Ontario is less than 300 feet above sea level, and the Tug Hill Plateau, about 25 miles in diameter, immediately east of Lake Ontario (centered east-northeast of Pulaski which is near the southeastern corner of the lake), is generally about 1,800 to 2,000 feet above sea level; this plateau is about 25 miles south-southeast of Watertown. Ordinarily the weather patterns here under similar synoptic conditions are obscured by widespread overcast and poor visibility, but on this day the patterns were vivid and sharp because of the strong wind, low moisture content, and clear air.—*C. R. Embree, 214 Draper Ave., Syracuse 4, N. Y.*

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